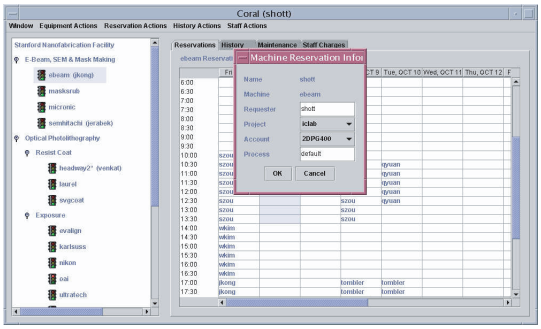
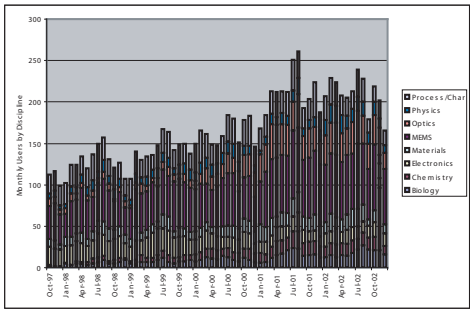
Stanford Nanofabrication Facility
A Multi-Disciplinary Research Laboratory
(http://snf.stanford.edu)

- One of the 5 founding members of the NNUN.
- 10,000 sq. ft. of Class 100 cleanroom space
- Full-service micro- and nanofabrication capabilities.
- Hands-on laboratory devoted to a wide range of substrate materials.
- Increasing activities in MEMS, Optical MEMS, Bio MEMS, and micro-fluidics in addition to traditional device and process characterization activities.
- Semi-weekly safety training plus equipment training streamline entry into SNF.

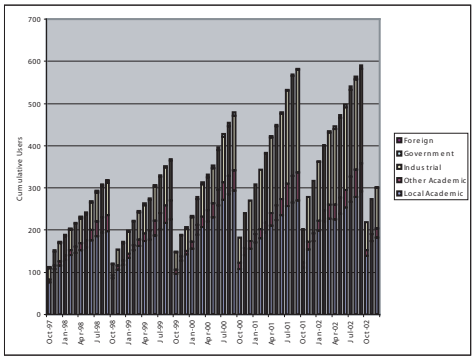
Coral laboratory management software
(custom Java application).
Being installed at MIT, Penn State, and U. of Minnesota



Number of monthly users by discipline



Cumulative (unique) users per year by affiliation

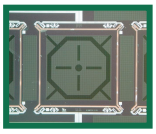


Fees for use of SNF:

Fee	Stanford Users	Other Academic Users	Industrial, Government, and Foreign Users
Equipment Usage	$75/$50 per hour ($1600 per month cap)	$75/$50 per hour ($1600 per month cap)	$150/$100 per hour ($3200 per month cap)
Direct Technician Use	$45 per hour	On site user: Free Remote: $45 per hour	$45 per hour
Introductory Training	Free	Free	Free
One-on-one training	Technician charges	Free	Technician charges
Overhead	57%	8%	57%

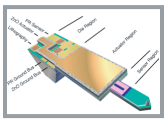
MEMS for Studying Insect Biomechanics

- Study of insect biomechanics provides engineering insights:
  - Design cues for biomimetic robots
  - Small-animal scaling laws in nature
- Multi-axis micromachined sensors enable measurement of insect running forces
  - Previous methods could resolve 0.1mN forces for large insects - MEMS sensors resolve 20nN forces
  - MEMS bandwidth & sensitivity reveal previously unseen running dynamics
  - First ever measurements of single leg forces produced by ants
- Work conducted w/ RJ Full (UC Berkeley)

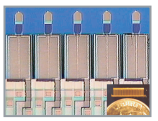


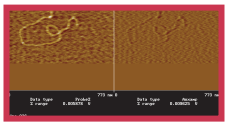
User: Michael Bartsch, Stanford Mechanical Engineering
Principal Investigator: Thomas Kenny, Stanford Mech. Eng.
NNUN Site: Stanford University

High-speed Atomic Force Microscopy for Biological Applications



We have increased the speed of scanning 10 fold through micromachined integration of the feedback actuator. The device (at left) is compatible with parallel operation, with an array of 50 independent probes (shown below left.) An image of a ladder DNA is shown below, with 10 nm resolution and over order of magnitude increase in speed.





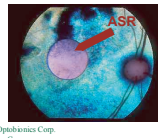
User:Todd Sulchek, Stanford
Principal investigator: Calvin Quate, Stanford
NNUN Site: Stanford University

Optobionics - Artificial Silicon Retina (ASR)

Optobionics has developed a retinal prosthesis to restore vision to people suffering from certain types of retinal disease.

- Since beginning clinical trials In June 2000, surgical implantations of ASRs have been performed in six patients.
- The implants continue to function electrically and remain stably in position. There are no signs of ASR degradation or rejection, no infection, inflammation or retinal detachment have been observed at this time. All patients report improvement in vision to varying degrees.

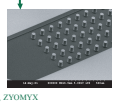
(Lower image: Fondus photograph of implanted ASR in a patient.)



User: Vincent Chow, Les Boglanowicz, George Melean: Optobionics Corp.
Principal Investigator: Vincent Chow, Optobionics Corp
NNUN Site: Stanford University

High Density Chip for Proteomics

- Multi-channel chip (250 protein binding assays per channel)
- Up to 10,000 assays per cm^2
- 3D chip (50 microns diameter features)
- High throughput serial dispensing or proprietary parallel dispensing
- Improved surface chemistry for enhanced sensitivity and for reduced non-specific binding
- On-site production facility
- Visit us at: http://www.zyomyx.com

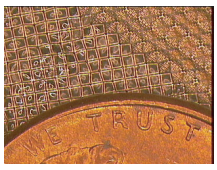


ZYOMYX

User: P. Zwahlen, P. Indermuhle, ZYOMYX
Principal Investigator: P. Wagner, ZYOMYX
NNUN Site: Stanford Univeristy

A Sensor System to Measure Contact Stress Distributions in the Human Knee

- Goal: To develop a flexible array of sensors to be inserted between cartilage plates in the knee joint to measure dynamic and spatial distribution of forces on cartilage.
- 1500 independent sensors to measure normal stress
- Flexible and extensible 2-D sensor array (conforms to complex knee cartilage curvatures)
- Sensor array <70 um thick
- 30 x 50 mm array
- Novel stress sensor design and processing



Sensor array on Silicone rubber backing is shown with a penny

User: Jack Kotovsky, UC Davis
Principal Investigator: Maury Hull, UC Davis
NNUN Site: Stanford University

Integrated Optics for Chip-based Electrophoresis

- Square hollow waveguides are used to integrate measurement of absorption with chip-based analytical separations based on electrophoresis.
- Simple fabrication: Definition of waveguides is done in the same, single patterning step used to define the electrophoresis channel. The separation channel and waveguides (both 50 X 50 mm) are etched as a negative pattern into a silicon master which is used to cast a PDMS mold.
- Light is guided by reflection at the air-PDMS interface, not total internal reflection.
- The waveguide has 60% efficiency over a distance of 3.2 cm. A detection limit (S/N=3) of 200 mM fluorescein is obtained using a 50 um path length and a simple photocell detector.

User: Bryan Splawn, Purdue University
Principal Investigator: Fred Lytle, Purdue University
NNUN Site: Stanford University